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REPORT

GE

SMOKE COMMITTEE

OF THE



CITIZENS' ASSOCIATION

OF CHICAGO.

ROOM 83, MERCHANTS' BUILDING.

MAY, 1889.

CHICAGO:

GEO. E. MARSHALL & CO., STATIONERS AND PRINTERS,
144 & 146 MONROE STREET.

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1889

OF CHICAGO.

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EDITION TO MEMBERSHIP
ON ALL AMERICAN

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CITIZENS' ASSOCIATION OF CHICAGO.

ROOM 33, MERCHANTS' BUILDING.

EXECUTIVE COMMITTEE, 1889.

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MURRY NELSON,

J. V. FARWELL, JR.

GEO. SCHNEIDER,
Treasurer.

J. C. AMBLER,
Secretary.

To the Executive Committee of the Citizens' Association :

The undersigned, Committee on Smoke, in accordance with the request and instructions transmitted to them in January, proceeded to the investigation of the "smoke nuisance," after due deliberation as to the proper method of conducting it, in the light of past experience and of more recently acquired information. They called to their assistance a mechanical engineer of intelligence and acquirements, who has made a thorough examination of the methods employed for the prevention of smoke in stationary boilers, and has condensed and tabulated his observations, as will be seen by reference to the accompanying statements.

The observations so made extended to 333 establishments where steam is in constant use for various purposes, including 839 boilers, of which 234 places have in use devices for the prevention of smoke, and 99 have no apparatus for the purpose; the particulars are minutely set forth in the tables prepared by the expert. From an analysis of these tables it will be seen that, although the devices in use have a very marked effect on the result, as to whether the smoke emitted from the chimneys is very black or offensive, so much so as to incline us to the opinion that a proper apparatus is almost indispensable for the complete suppression of the smoke nuisance; yet we believe that the greatest amount of good can be accomplished by careful attention to the firing, and the use of a good quality of coal. By combining these three conditions—an efficient smoke preventing device, a fair quality of coal, and careful firing—the offense arising from the chimneys in the business and manufacturing parts of the city can be reduced to insignificance.

Good results have been obtained by mingling coke, or anthracite screenings, with soft coal; but that is practiced to but a small extent, and its beneficial effect is commensurate, after all, with the observance of proper conditions as to use, which are a part of, and included in the general term—careful firing. We see, by examination of the tables given, that the smoke arising from some chimneys where the poorest quality of coal is used, is reported as very light, when accompanied by the observation of careful, or automatic mechanical stoking.

The practice of "crowding the furnaces" with fuel is one of the most prolific sources of offensive smoke that we have to contend with; this is made necessary, or believed to be necessary from the insufficient size of boilers, or of chimneys, to perform their work. The fires have to be urged to their utmost capacity to keep up the requisite amount of steam, and this is done at a great waste of coal, the custom being to put on as much fuel as the furnace will hold, and then rake it out from below when insufficiently, or not thoroughly, burned, to make room for a fresh supply above; the result being that the outer air gets an amount of dense smoke that annoys the public, while the proprietor of the establishment pays for a large amount of fuel of which he gets no benefit. The same result occurs from heedlessness of engineers and firemen who, from indolence or ignorance, completely fill their furnaces with coal at certain periods, and pay no further attention to their fires until the time comes to give the furnace a fresh charge of fuel; all chimneys where such practices obtain emit dense smoke more than half the time. Firing should be as intelligently done as any other work; modern requirements call for perfection in most occupations or trades; yet in many cases this important business is left to the discretion, or want of discretion, of men who seem to take no interest in the welfare of their employers, or the convenience of the public. Sometimes a mistaken idea of economy induces merchants to keep a cheap man in the boiler room, who will waste more fuel than the amount of his monthly wages. Instead of crowding the furnaces by heaping up fuel upon half burned coal, the stoking should be done a little at a time, so that the greater surface of the fire will show, at all times, either an incandescent mass, or a bright flame; the last charge of fuel should be pushed back and spread over this, and the new charge put in its place; the ashes should be carefully raked out at fixed and frequent periods; by this process the steam can be kept up at two-thirds the cost of the fuel used in the practice usually adopted—that of crowding the furnace to its utmost capacity; but to accomplish it there must be intelligence and integrity in the boiler room as well as in the other departments of the establishment.

We are of opinion that the suppression of smoke, as a nuisance, is within the power of those who own the stationary boilers, and of the men who have charge of them; the former have no moral or legal right to subject their immediate neighbors, or the public, to the damage to health and property caused by their own inattention; they should act in unison, and exert their

undisputed authority to compel their employes to do their manifest duty. We have made several attempts to get an ordinance passed inflicting a fine upon engineers and firemen, in cases where the proprietors of establishments have furnished them with a suitable device for the prevention of smoke; but it has been hitherto found impossible to pass such an ordinance, and nothing remains to be done, but to bring about a consensus of opinion, and unity of action in the premises by those interested.

If the proprietors will but insist upon the observance by their engineers of certain conditions, (which should include the constant application of the smoke preventing apparatus, where there is one, under the penalty of suspension or discharge,) and supply them with a suitable device, and the quality of coal found from observation to be appropriate to the set of the boiler, the height of the chimney, and the kind of smoke preventing apparatus adopted, the greater part of this appalling nuisance can be abated. The proprietors must, however, give to this matter the proper measure of their personal attention to insure the desired result.

The principle of smoke prevention is extremely simple; but, as it is not generally understood, it may be well to explain here the cause of smoke, and the method of its prevention. When heat is applied to bituminous coal a gas is generated which is our ordinary illuminating gas in a crude state. It burns freely when mixed with the proper quantity of air. Smoke results from the failure to burn this gas in the furnace. The failure to burn the gas in the furnace results invariably from one of two causes; either, because air has not been admitted to mix with it in proper quantities and in the proper manner—in a thin sheet, or through small perforations—or, because the fireman has so completely covered the grate bars with fresh coal, as to leave no flame or heat to ignite the gas after it has received the proper admixture of air.

Any device which admits air in proper quantities into the furnace will prevent smoke, unless its operation is defeated by bad firing; that is, by piling coal upon the grate until the flames are smothered, or until more gas is created than can be absorbed by the amount of air ordinarily admitted. It is somewhat easier and less troublesome to fire badly than to fire well, because good firing requires that a small quantity of coal shall be applied at frequent intervals; and an indolent fireman prefers to throw a large quantity on the grate, and to have a longer interval of rest. The fireman, or the friendly engineer, persuades the proprietor that any

device which he may have adopted is a failure, as this excuses the acts of the fireman.

We consider the first step in the direction of an abatement of the smoke nuisance to be the education of the proprietors of steam boilers to the fact that they have in their own hands the cure of the evil, as far as their own furnaces are concerned.

In view of the large percentage of inefficient firemen, and of their ability to defeat the action of most devices, we regard the various self-feeding furnaces as more to be relied upon for the prevention of smoke than any others, as they are automatic in their action, and the best of them seem almost invariably to produce good results. The automatic furnaces commend themselves to those who count the cost of heat and power and of smoke prevention, as they admit the use of the cheapest fuel without making smoke.

Several of the devices mentioned in the accompanying tables are excellent for the purpose required; specimens or patterns of all are within easy visiting distance of every business establishment in the city; the inventors are but too anxious to exhibit their apparatus; inefficient systems should be discarded; and a brief but thorough examination should be made of the most approved patterns, with the object of selecting the device best suited to the existing conditions, which can be readily compared with others. It certainly is not unreasonable to ask for as much attention to this important subject as would be given to the purchase of a carriage, or to the introduction of house-heating apparatus, or a kitchen range.

The City Council has formed a committee to visit and inspect the various devices so that they can report on several patterns, some one of which may be found useful in any given case: it will afford us pleasure to aid them in every way. We shall, ourselves, make such a visit for the purpose of verifying our expert's report.

These remarks and considerations apply equally to the prevention of smoke in tugs and locomotive engines; the law with regard to the offense in their case makes the engineers subject to the penalty imposed; but no regard is paid to it. Observations made after navigation opened, this spring, demonstrated that the greater part of the nuisance can be abated by careful attention to the firing; trips made with our expert on board showed this conclusion; also that soon after he had left the smoke burst forth again without abatement; there are devices on some of these vessels which

modify its volume when in use; but they are not sufficient, and are seldom in operation. As to locomotives, there is much difference in the degree of annoyance on different roads, depending, as in all other cases, on the care taken by the firemen. Recent observations show, however, that there is an apparatus which will absolutely prevent smoke on locomotives, and probably on tugs, and we refer to the notes of our expert for an account of it.

We have entered into correspondence with the magistrates of some English cities relative to the means of suppression in vogue there; these do not differ very materially from ours; the devices do not vary in principle of construction from those in use here. The powers conferred by law on municipal authorities are, in some instances, greater than ours; they have the authority, which ours have not, to compel the alteration of flues, and the use of appliances. Their mode of procedure in case of offenses is by summons and fine, which apply to the employe as well as the proprietor of an establishment offending.

Our recommendations are: That, as the Mayor has appointed a competent officer whose sole duty it has become to thoroughly investigate the smoke question, with a view to its speedy and permanent solution, the Citizens' Association shall tender to the city authorities their co-operation in all efforts for the suppression of the nuisance; and that, as a means to the end desired, an ordinance be passed amplifying the scope of the present city law with regard to the liability of firemen and engineers of stationary engines, and enabling the officers to suppress the nuisance at sight; and, that the City Smoke Bureau be so constituted that daily observations shall be made, with the object of pointing out to delinquents how their smoking chimneys can be remedied, and of enforcing the ordinance in all respects. We would, also, suggest that in any general revision of the Building Ordinance, provision be made for scientific construction of the boiler rooms and smoke stacks of factories and large mercantile buildings, with an especial view to smoke prevention.

Respectfully submitted,

BRYAN LATHROP,
JOHN H. LONG,
AUGUSTUS NEWELL,
FRED. BAUMANN,
W. J. CHALMERS,

Committee.

CHICAGO, May 20, 1889.

NOTES BY THE EXPERT EXAMINER.

A fireman who understands his business, and has a good grade of coal, can prevent a great amount of smoke if the details of his steam plant are proper; in many cases the boiler capacity is entirely inadequate to the demands upon it, and the fires have to be crowded to the utmost; smoke of the blackest kind is thus commonly evolved, without accomplishing the object. In numerous other cases the chimney capacity is entirely too small for the number of boilers attached to it; sometimes two, three, or even four boilers are dependent upon a small chimney, projecting but a few feet above the roof of the building, and often surrounded by others much higher; the draft is, in such cases, impeded, and much unnecessary smoke the consequence; a "smoke burner" of the proper pattern will assist materially in increasing the draft. The majority of the smoke preventing devices are of but little benefit, and in some cases have been of positive injury to the boilers; and even where the better style are in use, carelessness in firing, the use of an inferior grade of coal, or the sudden or habitual "crowding" of the fires, one or all together, cause much smoke at times, or at all times; of course, an apparatus will not prevent smoke, if not applied, or improperly handled. One of the first conditions for success is "don't crowd the boilers"—to use the common expression.

In some establishments in the business district the engineer has to do duty as stoker,—do his own firing; he has also charge of the elevator, and the steam-heating, and of other business; if anything occurs in any part of the building he is sent for to "fix things;" leaving his post to go to the top story, perhaps, without knowing when he shall return, he crowds his furnace full of coal, with the result of sending a dense volume of smoke out of the chimney.

These observations show that there are many instances where good apparatus does not prevent smoke, while the same device works perfectly in other cases. The causes are very evident: inadequate chimney capacity, inferior coal, imperfect and faulty setting of the boiler, or careless management of fires; here again

there is evidence that unless all details are properly arranged, and the fires carefully attended to, —in short, unless there is careful and judicious management of the whole plant, smoke will be apparent. There were expressions, in some cases, of ill-feeling with regard to the prosecutions by the city authorities, but, on the other hand, the infliction of a fine has often, confessedly, done good.

Every tug, and nearly every locomotive engine observed, was belching forth great volumes of intensely black smoke; the exceptions were on the Illinois Central suburban trains: on inquiry it was found that this Company uses bituminous coal; but the nuisance was, in their case, much less than on other locomotives, owing to careful firing. A number of tugs have steam jets in their smoke-stacks, which helps to some extent: that careful firing is the best remedy was demonstrated on the trips made, the same tugs were very offensive before and after the trips. The difficulties to be overcome on tugs and locomotives are greater than in the case of stationary boilers.

May 17. Trip on engine No. 93, Wisconsin Central Railway, —accompanied by the inventor of the device attached thereto, W. C. Thayer.

The trip from Chicago to Harlem and return was made without any visible smoke issuing from the stack of the engine, except once, when upon the suggestion of your examiner, the valves leading to the consumer were closed, whereupon dense volumes of black smoke instantly issued from the stack, to be just as quickly dispelled by again opening the steam valves. Observations were made on the following day, and another trip was made as a passenger, unknown to anybody, to see if the device would show equally good results, and it was found to work just as perfectly, as when the writer rode on the engine. There seems to be no further excuse for so much black smoke from locomotive engines in the city of Chicago, while there is such a simple, inexpensive and efficient device within the reach of all, and it would seem that the adoption of this cannot be urged any too strongly, especially as a considerable saving of fuel is said to be effected by its use. The same device is suited to tug furnaces.

RECAPITULATION OF SMOKE OBSERVATIONS, 1889.

NAME OF DEVICE.	NUMBER BOILERS OBSERVED.	MODE OF FIRING.		NUMBER MAKING SMOKE.		
		GOOD.	INDIFF. OR BAD	BLACK.	MEDIUM.	LITTLE OR NONE.
MCGINNIS-----	89	76	13	4	10	75
STEAM JETS-----	73	42	31	23	20	30
MURPHY FURNACE-----	70	70	0	0	0	70
HUTCHINSON -----	55	32	23	26	14	15
ARCHES OVER BRIDGE WALL-----	54	31	23	15	16	23
BUTMAN -----	34	30	4	2	10	22
SMITH -----	34	22	12	10	2	22
BOWE -----	40	36	4	4	5	31
MURPHY JETS-----	13	11	2	2	5	6
ORVIS -----	14	12	2	5	6	3
ROONEY FURNACE-----	12	10	2	2	0	10
A. RITTER -----	12	12	0	0	0	12
KELLEY -----	11	5	6	1	4	6
RITCHIE -----	14	12	2	0	8	6
OLSON -----	13	12	1	1	0	12
FARR -----	24	20	4	0	0	24
MCLAUGHLIN -----	8	6	2	2	2	4
RAFFERTY -----	7	3	4	4	1	2
THAYER -----	4	4	0	0	0	4
MISCELLANEOUS and NAMELESS de- vices; for particulars see daily reports of observations-----	93	53	112	107	27	31
NO DEVICE USED -----	165					

RECAPITULATION OF SMOKE OBSERVATIONS WHERE NO SMOKE PREVENTIVE DEVICE IS USED.

Number of places visited,	98	63	35	54	29	15
" " where firing is bad, (64 per cent),						
" " " good, (35 per cent),						
" " making black smoke,						
" " " light or very light smoke,						
" " medium smoke,						

WITHOUT ANY DEVICE.

Out of 63 cases of improper firing, 54 made black smoke, or 85 per cent. " 35 " good firing, 29 made very little smoke, or 83 per cent. " 63 " bad firing, only 2 are shown making light smoke.

SMOKE OBSERVATIONS, 1889.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THEM- O-METER. METER.	REMARKS.
Feb. 19	Swannell Mfg. Co. N. S.	1 Wilcox, 75 1 tubular 15	none. Grucon & Yciter.	indiff. careful.	III. coal. Ind. block.	black. light.	0 4	March 20. Very black.
"	Gormully & Jeffery.	1 tubular 15	none.	careful.	III. coal & shavings.	light.	30	
"	C. A. Smith & Co.	1 tubular 15	none.	careful.	III. coal.	light.	6 7	30
"	Brunswick B. & Collender.	4 tubular 250	brick arches.	careful.	III. coal.	light.	7 30	
"	Shufeldt Distillery.	8 tubular 300		crowded & careless.	III. coal.	very black.	9 8	30
"	A. Richter.	2 tubular 15	none. Smith.	indiff.	soft coal & shavings.	black.	8	30 Consumer not in use.
"	Cribben, Sexton & Co.	2 tubular 100	Hutchinson.	heavy and indiff.	soft coal.	medium.	10	30 sometimes very black smoke.
"	C. F. Elmes, W. S.	1 tubular 50	brick arches.	careful.	III. coal.	none, or very light.	10	30 Cave drawing of device.
"	Gradle & Strotz, S. S.	1 tubular 40		indiff.	Streator.	medium and black.	10	30
"	Storm & Hill.	2 tubular 75		careful.	Minonk.	very light.	11	30
"	Strauss, Ullman & Guthman.	2 tubular 100		careful.	Ind. block.	very light.	10	30 Say will smoke if crowded.
"	Norton Milling Co. W. S.	2 tubular 150		careful.	Streator.	none, or very light.	9	30
"	Wholesale H. Carson, Pirie & Co. S. S.	3 tubular 150	Murphy furnace.	automatic.	Ind. block.	very light.	9	30 March 20. Black.

Feb. 19	Selz, Schwab & Co.	3 tubular 150	Olson.	careful.	Ill. coal. medium and light.	8	30	Consumer not in use when visited.
20	Franklin MacVeagh & Co.	2 tubular 100	steam jets.	careful	Ind. block. medium, very black	0	30.2	
20	Retail Marshall Field & Co.	5 tubular 400	McCrinis.	careful.	Pittsburgh, very light.	2	30.2	March 29, Black
20	First National Bank,	2 tubular 100	Fitch.	indiff.	Ind. block. light, but at times black.	4	30.2	March 29, Black
20	S. A. Maxwell & Co.	2 tubular 75	steam jets, but not used	careful.	Ind. block. black.	5	30.2	
20	Tobey Mfg. Co. S. S.	2 tubular 150	Olson.	careful.	Ind. block. light.	6	30.2	
20	Fairbanks, Morse & Co.	2 tubular 100	Butman.	careful.	soft coal. light.	8	30.2	
20	A. Hillman & Co.	1 tubular 40	Hutchinson.	light and careful.	Ind. block, screenings.	10	30.2	
20	Chicago Refrigerator W. House Co. W. S.	1 tubular 40	steam jets.	light and careful.	Pittsburgh.	12	30.2	
20	Eckhardt & Swan.	2 tubular 120	Smith, Ayne, steam jets and brick arches.	indiff.	Ill. coal. black.	12	30.2	
20	Tappan & Wheeler.	2 tubular 75	steam jets,	careful.	soft coal. a little bl'k smoke.	12	30.2	
20	Salter & Bilek.	2 tubular 100	steam jets and arches.	indiff.	soft coal & shavings. light.	11	30.2	
20	Chicago Hardware Mfg. Co. N. S.	2 tubular 50	Hutchinson.	careful.	Ill. coal. light.	10	30.2	When crowding, much smoke.
20	B. V. Page.	2 tubular 100	Murphy furnace.	automatic.	soft coal. very light.	10	30.2	
21	Ph. Rinn, N. S.	2 tubular 100	none.	crowded.	soft coal & much black smoke.	10	30	
21	M. Schultz, W. S.	1 tubular 50	none.	indiff.	soft coal & shavings.	12	30	

SMOKE OBSERVATIONS, 1889.—Continued.

DATE,	NAME,	BOILERS, HORSE POWER,	DEVICE IN USE,	MODE OF FIRING,	COAL USED,	CONDITION OF SMOKE,	THE METER— HARO-M METER.	REMARKS.
21	N. W. Lead & Oil Mfg. Co.	2 tubular 100	none.	careful.	nut coal & hard coal screenings,	light.	13	30
"	Schumacher & Betzel.	2 tubular 100	none.	careless.	shavings & soft coal,	much black smoke.	13	30
"	Dawson Bros.	2 tubular 100	drum in front.	-----	Pittsburgh nut.	very light.	18	30
"	Pitkin, Bond & Co. S. S.	2 tubular 75	Farr.	careful.	Ind. block.	none or very light.	24	30
"	Chicago Edison Co.	4 Heine Safety 400	Jarvis furnace.	careful.	Ind. block.	light.	30	30
"	Blake, Shaw & Page.	2 tubular 120	Farr.	careful.	Ind. block.	very light.	32	30
"	Insurance Ex. Bldg.	2 tubular 100	Ritchie.	careful.	Ind. block.	light.	34	30
"	Wholesale H. Marshall Field & Co. S. S.	8 tubular 400	McGinnis.	careful.	Pittsburgh.	very light.	38	30
"	Chas. P. Kellogg & Co.	2 tubular 75	Bowe.	careful.	Pittsburgh.	light.	40	30
"	Sweet, Dempster & Co.	2 tubular 75	Fitch.	careful.	III. coal.	medium.	40	30
"	Cahn, Wampold & Co.	1 tubular 80	McGinnis.	careful.	Pittsburgh.	light.	40	30
"	Phelps, Dodge & Palmer.	2 tubular 100	brick arches.	careful, but a little crowded.	Minonk.	medium.	40	30
25	Tremont House.	2 tubular 120	Murphy jets.	indiff.	III. coal.	medium, at times very black.	10	30

25	Sherman House.	tubular 150	steam jets.	indiff.	Pittsburgh.	medium.	10	30	March 20. Very black.
44	McCormick Block.	tubular 100	McGinnis.	careful.	Ind. block.	light.	12	30	
11	Opera House Block.	tubular 6 240	Hutchinson.	careful, but crowded.	Ind. block.	very black.	13	30	March 20. Very black.
11	Chicago Club Bldg.	tubular 80	McLaughlin.	indiff.	Ind. block.	light and black.	14	30	
44	Crerar, Adams & Co.	tubular 40	air-ducts,	careful.	Wilm'gton	medium.	16	30	
11	N. W. corner of Lake & Franklin Sts.	tubular 80	none.	careful.	Wilm'gton	light.	18	30	
11	Chicago Ave. Light & Power Co.	4 tub 700 H. P.	Bowe, Blitman.	careful.	Ind. block.	light to medium.	20	30	March 20. Very black.
11	W. S. Vaughan & Bushnell.	tubular 50	brick arches.	careful.	soft coal screenings.	light.	22	30	
11	Gau,	tubular 100	Murphy furnace.	automatic.	soft coal screenings.	light.	20	30	
11	Plamondon Mfg. Co.	tubular 50	brick arches.	careful.	III. coal.	light.	20	30	
11	Wacker & Birk Brewery Co.	tubular 230	none.	careful.	soft coal screenings.	ordinarily light.	20	30	At times much black smoke.
11	N. S. Adams & Westlake.	tubular 5	McGinnis.	careful.	Ind. block.	light.	24	30	March 20. Very black.
26	S. S. Metropolitan Block.	tubular 120	brick arches.	ordinary.	III. coal.	light, but at times very black.	28	30	March 20. Very black.
11	Daily News.	tubular 120	Hutchinson.	careful.	Laurel Hill	black.	29	30	March 20. Very black.
11	Major Block.	tubular 100	steam jets.	careful.	soft coal.	light.	30	30	
11	Taylor Building.	tubular 100							

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	POWERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THEEMER- METER, BAK- METRE.	REMARKS.
26	National Life Ins. Bldg.	55 1 tub. 120 2 tub.	Olson. McGinnis.	crowded.	Ind. block.	light, but at times black.	31	March 20. Black.
"	Gore's Hotel.	4 tubular 150	Murphy jets.	careful.	Ind. block.	light.	32	30
"	Traders Building.	4 tubular 160	Rafferty.	indiff.	soft coal.	black.	32	20
"	Phenix Ins. Bldg.	4 tubular 250	brick arches.	careful.	Ill. coal.	medium.	33	30
"	W. Union Tel. Bldg.	2 tubular 100	Hutchinson.	careful.	Ind. block.	medium.	34	30
"	Siegel, Cooper & Co.	2 tubular 150	Olson.	careful.	Ind. block.	light.	34	30
"	Exchange Building.	3 tubular 120	steam jets.	indiff.	Ind. block.	black.	34	30
"	Rialto Building.	6 tubular 300	Farr.	careful.	Ind. block.	light.	34	30
"	Board of Trade Bldg.	6 tubular 400	Butman.	careful.	Ind. block.	light.	34	30
27	N. S. Vogler & Gendtner.	1 tubular 190	Hutchinson.	indiff.	Ind. block & shavings.	black.	33	30
"	McFwen Mfg. Co.	2 tubular 100	Smith.	careful.	soft coal & shavings.	light.	33	30
"	Theo. A. Kochs.	2 tubular 80	Smith.	careless.	soft coal.	very black.	34	30
"	Spielman Bros.	none.						At times they make very black smoke. When consumer was turned off, very black smoke. Much very black smoke produced at all times.

27	Union Wire Mattress Co.	1 tub. 1 120	Hutchinson. none.	indif.	Ind. block & shavings	medium.	34	30
"	N. S. Chicago Rawhide Mfg. Co.	1 tubular 30	fan for forced draught.	careful.	soft coal screenings	light.	34	30
"	Chicago Drop Forge Co.	2 tubular 100	H. T. Russell's patent petroleum burner.	-----	none or crude petroleum.	very light.	34	30
"	Streeter Iron Works.	1 tubular 50	Kelley.	crowded.	Pittsburgh nut.	medium.	34	30
"	S. S. Ashland Block.	2 tubular 120	Murphy jets.	careful.	Ind. block.	medium.	35	30
"	Portland Block.	2 tubular 80	Ritchie.	careful.	Ind. block.	light.	36	30
"	III. Bank Building.	2 tubular 100	none.	careful.	Ind. block.	medium.	35	30
"	Howland Block.	2 tubular 80	steam jets.	indif.	Ind. block.	medium.	35	30
"	Adams Ex. Bldg.	4 tubular 200	Kelley.	indif.	Ind. block.	medium.	34	30
"	Temple Court Bldg.	2 tubular 100	Rafferty.	careful.	all kinds.	light.	34	30
"	James H. Walker & Co.	2 tubular 100	steam jets.	indif.	Ind. block.	light.	33	30
28	N. S. Superior Nickel Works	1 tubular 60	McGinnis.	careful.	Ill. coal.	some smoke.	28	30
"	H. J. Berry.	1 tubular 50	none.	careless.	Ill. coal.	much bl'ck smoke.	28	30
"	R. W. McCready.	1 tubular 50	none.	careful.	nut coal.	light.	29	30
"	John Mohr & Son.	1 tubular 50	Murphy furnace.	automatic.	Ill. nut.	light.	30	30
"	Empire Steam Cooked Rice Co.	1 tubular 15	brick arches.	careful.	Ind. block.	very light.	31	30

Have seen some black smoke occasionally.

The arrangement here was the engineer's own invention. Would not give particulars until patented.

SMOKE OBSERVATIONS, 1889.—*Continued.*

DATE.	NAME.	ROLLERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THE BARO- METER. METER.	REMARKS.
28	Davidson & Sons.	2 150	steam jets.	indif.	Ind. block.	at times light.	32	Much black smoke at times.
"	Tudor Buggy Co.	1 30	none.	careful.	soft coal.	medium.	33	30
"	Galena Elevator.	2 150	McGinnis,	careful.	Ind. block.	light.	34	30
"	Cable Car Eng. House La Salle & III. Sts.	2 tub, 1 " 100	H. P. Rooney furnace. none.	crowded.	soft coal screenings.	much black smoke.	35	30
"	S. S. Borden Block.	2 100 16	none.	careful.	hard coal scravings & lump coal.	light.	36	30
"	N. S. Kirk's Soap Factory.	tub. 1200 H. P.	Murphy furnace.	automatic.	soft coal screenings.	very light.	35	30
"	S. S. Sherman Bros. & Co.	tubular 50	Hutchinson.	careful.	soft coal.	light.	34	30
2 W. S.	Bradley Mfg. Co.	4 200	McGinnis,	crowded and indif.	III. coal.	medium.	34	30
"	J. C. Meyer.	1 50	Hutchinson.	crowded.	nut coal.	black smoke.	34	30
Consumer not in use.								

The condition of the weather to-day being rather peculiar—murky, with low barometer—the day was spent in taking observations on the ground already gone over; in order to note the effect of the weather upon the smoke production. It gives me pleasure to be able to report that taking it altogether, there was much less smoke produced, than at any time since my observations were begun. A few places were vomiting forth the usual amount of smoke, as for instance the Sherman, the Chicago Opera house block, and some of the factories on the North side, prominent among which were those at Market and Huron streets; and at 36 Erie street, the last of which I have repeatedly observed, and found to emit volumes of smoke at times; they have a consumer, but it is evidently not in use. Other buildings giving forth less smoke than usual, it might possibly be due to the fact, that the day being rather mild less steam was used for heating purposes than usual, and consequently firing was proportionately lighter, and in places visited this was substantiated in every case.

2	Chicago White Lead & Oil Works.	3	tubular	brick arches.	careful.	Ind. block.	light.	34	30
11	New England Mills.	2	tubular	none.	indiff.	soft coal.	much bl'ck smoke.	34	30
11	Fraser & Chalmers.	4	tubular	Hutchinson.	careful.	soft coal.	light.	34	30
11	Brewer & Hoffman Brewery Co.	2	tubular	none.	careful.	Ind. block.	light.	34	30
11	S. S. Merchants' Building.	2	tubular	McGinnis.	careful.	soft coal.	very light.	34	30
11	Heath & Milligan Co.	100	tubular	McGinnis.	crowded and indiff.	soft coal.	much bl'ck smoke.	34	30
11	88 and 90 La Salle St.	3	tubular	McGinnis.	indiff.	Ind. block.	black smoke.	34	30
11	S. D. Kimbark.	150	tubular	steam jets.	careful.	Ind. block.	black smoke.	34	30
11	McNeil, Higgins & Co.	2	tubular	Murley.	careful.	Ind. coal.	very light.	34	30
11	Central Music Hall.	80	tubular	Orvis.	careful.	Ind. coal.	light.	34	30
11	Fellore Block.	1	tubular	Hutchinson.	careful.	hard coal.	none.	34	30
11	Equitable Building.	50	tubular	Orvis.	careful.	Laurel Hill	medium.	34	30
11	95 & 97 Washington St.	1	tubular	steam jets.	indiff.	Ind. block.	medium.	34	30
4	Hawley Block.	50	tubular	Orvis.	indiff.	Ind. block.	medium.	35	29 ⁷
11	Willoughby, Hill & Co.	2	tubular	Butman.	indiff.	Ind. block.	medium.	35	29 ⁷
11	Montauk Block.	120	tubular	Hall.	careful.	Ind. block.	very light.	35	29 ⁷
		120	tubular	Ritchie.	careful.	ordinarily	ordinarily light.	35	29 ⁷
									Have never seen any black smoke from this place. Have seen some very black smoke issue from here.

SMOKE OBSERVATIONS, 1889.—*Continued.*

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	REMARKS.
4	S. S. Bay State Building.	2 tubular 100	McGinnis.	careful.	Ind. block.	light.	29.7
"	Brenton House.	2 tubular 80	Smith.	careful.	soft coal screenings.	black.	29.7
"	Franklin Building.	2 tubular 120	McGinnis.	light and careful.	soft coal screenings.	light.	29.7
"	Loeb Building.	1 tubular 50	Murphy jets.	careful.	III. coal.	medium.	29.7
"	Rubel Bros. Building.	2 tubular 100	McGinnis.	careful.	Ind. block.	light.	29.7
"	Girard Building.	2 tubular 120	Farr.	careful.	soft coal screenings.	light.	29.7
"	Commerce Building.	6 tubular .90	Ritchie.	careful.	soft coal screenings.	medium.	29.7
"	Royal Ins. Building.	4 tubular 200	Butman.	careful.	Ind. block.	light.	29.7
"	The Fair.	2 tubular 120	Bowe.	careful.	Ind. block.	very light.	29.7
5	W. S. Burton Block.	2 tubular 120	brick arches.	indiff.	Ind. block.	medium.	29.5
"	Fortune Bros. Brg. Co.	4 tubular 200	Murphy furnace.	automatic.	III. coal.	very light.	29.5
"	Knisely Building.	3 tubular 150	brick arches.	careful.	III. coal.	light.	29.5
"	Munson's Building.	1 tubular 50	McGinnis.	careful.	Ind. block.	light.	29.5

5	S. E. corner of Canal & Washington, Gates Building.	tubular 30 1 tubular (6)	none. drum in front.	indiff. indiff.	nut coal & shavings. Ill. coal.	medium. light.	38	29.5
6	Jackson Building.	tubular 2 100	Hutchinson.	crowded.	Ill. coal.	black.	38	29.5
6	St. Paul Elevator.	tubular 4 200	McGinnis,	careful.	Ind. block.	very light.	38	29.5
6	S. S. Calumet Building.	tubular 2 100	Bowe.	careful.	Ind. block.	very light.	38	29.5
6	S. S. Home Ins. Building.	tubular 4 200	A. Ritter.	.....	Ind. block.	very light.	38	29.7
6	Rand, McNally & Co.	tubular 100 4 200	Smith & Bowe. Farr.	careful.	Ohio coal.	light.	38	29.7
6	Mandel Bros.	tubular 3 120	none.	careful.	Pittsburgh.	very light.	38	29.7
6	D. B. Fisk & Co.	tubular 2 100	brick arches and steam jets.	careful.	Ind. block.	light.	38	29.7
6	Lenox Building.	tubular 2 100	McGinnis.	careful.	Ind. block.	light.	38	29.7
6	I. J. McCormick Bldg.	tubular 2 100	arches. steam jets.	careful.	Ind. block.	light.	48	29.20
6	Hibbard, Spencer & Co.	tubular 1 60	.....	crowded.	Ill. coal.	.....	48	29.20
6	G. W. Ludlow & Co.	tubular 40	J. D. Lee's patent.	careful.	Ind. block.	light.	48	29.20
6	68 & 70 Wabash Ave., C. H. Blakeley.	tubular 1 40	McGinnis,	.....	Ill. coal.	none.	48	29.20
6	Lord, Owen & Co.	tubular 2 75	none.	light and careful.	Ill. coal.	medium.	48	29.20
6	A. F. Risser.	.....	.....	.....	.....	.....	.....	.....

SMOKE OBSERVATIONS, 1889.—*Continued.*

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	METER, BARO.	METER, THERM.	REMARKS.
6	French, Potter & Wilson, Chicago Carpet Co.	tubular 3 12 2	Backus, Stanton.	careful.	Ohio.	medium.	48	29.20	March 20. Black.
"	Rookery Building.	tubular 8 40 2	A. Ritter, Gulickson.	careful.	Laurel Hill	medium.	48	29.20	
"	Foreman Building.	tubular 120 2			Ind. block.	very light.	48	29.20	
"	Jos. Beifield & Co.	tubular 100 2	Bowe.	careful.	Ind. block.	medium.	48	29.20	
"	Calumet Paper Co.	tubular 100 5	none.	ordinary.	Ill. coal.	black.	48	29.20	
"	Grand Pacific Hotel.	tubular 250 3	Orvis.	careful.	Ill. coal.	medium.	48	29.20	March 20. Very black.
7	S. S. Edson Keith & Co.	tubular 150 2	Smith.	careful.	Ind. block.	light.	35	29.5	
"	Argyle Building.	tubular 100 1	steam jets.	light and careful.	soft coal screenings.	light.	35	29.5	
"	Pulman Building.	tubular 300 2	Latham.	careful.	Laurel Hill	medium.	85	29.5	March 20. Very black.
"	Lakeside Building.	tubular 100 1	McInnis.	light and careful.	Wilson coal	very light.	35	29.5	
"	Monroe & Fifth Ave., Owings Building.	tubular 60 2	none.	Ind. block.	light.		35	39.5	Black at times. March 20. Very black.
"	Telephone Building.	tubular 120	none.	careful.	pitsch, nut & h'rd coal.	light.	35	29.5	March 20. Very black. screenings.

7	Barnhart Bros. & Spindler.	tubular 50	Smith. McGinnis.	indiff. crowded.	Ill. coal. Ind. block.	medium. light.	35 35	29.5 29.5	
6	Strauss, Goodmunt, Vondorf & Co.	tubular 100	Smith.	light and careful.	Ill. coal.	light.	35 35	29.5 29.5	March 20. Very black.
6	Henry W. King & Co.	tubular 120	4 Schroll furnaces. 4 steam jets.	careful.	Pittsburgh.	very light.	35 35	29.5 29.5	
6	J. V. Farwell & Co.	tubular 600	steam jets.	indiff.	Ill. coal.	medium.	35 35	29.5 29.5	March 20. Black.
6	C. M. Henderson & Co.	tubular 100	arches.	careful.	Ind. block.	light.	35 35	29.5 29.5	
6	Wholesale H. Wilson Bros.	tubular 120	none.	careful.	Ind. block.	light.	35 35	29.2 29.2	
8	85 and 87 Fifth Ave., White Building.	tubular 40	none.	indiff.	Pittsburgh.	black.	35 35	29.2 29.2	
6	Monroe St., 237 & 239,	tubular 100	Farr.	careful.	Ind. block.	none or very light.	38 38	29.2 29.2	
6	Wheeler Building.	tubular 120	Orvis.	careful.	Ind. block.	light.	38 38	29.2 29.2	
6	Br. Jonathan Bldg.	tubular 120	none.	careful.	soft and hard coal screenings.	light.	38 38	29.2 29.2	
6	Schniedewind & Lee Co.	tubular 60	Smith.	light.	Ind. block.	black.	38 38	29.2 29.2	
6	Geo. F. Kimball.	tubular 150	Farr.	careful.	Ind. block.	light.	38 38	29.2 29.2	
6	S. S. A. C. McClurg & Co.	tubular 100	Hutchinson.	careful.	Ind. block.	light.	30 30	29.2 29.2	
9	W. S. Dako Bakery.	tubular 120	McGinnis.	careless.	Wilm'gton	light to medium.	30 30	30 30	
6	Rice & Whittore.	tubular 120	Thayer.	careful.	Wilm'gton	light to medium.	30 30	30 30	
6	Wm. J. Moxley.	tubular 50							

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	METERED HARO. METER.	REMARKS.
9	Whitman & Barnes Mfg. Co.	1 tubular (0)	none.	careful.	Ind. block.	light.	30	30
11	Collins & Burge.	1 tubular 75	steam jets.	indiff.	Ill. coal.	black.	30	30
11	Wight & Lawther Mfg. Co.	3 tubular 200	McGinnis.	careful.	Wilm'gton	light.	30	30
11	Young & Farrell.	2 Babcock & Wilcox 150	none.	careful.	Streator.	light.	30	30
11	S. S. F. H. Hill Co.	2 tubular 120	Douglas.	careful.	Wilm'gton	light.	30	30
11	Geo. H. Taylor & Co.	2 tubular 100	Smith.	careful.	Ind. block & coke.	light.	30	30
11	Appleby Building.	2 tubular 150	Murphy jets.	careful.	Ill. coal.	medium.	30	30
11	Fuller & Fuller.	2 tubular 100	none.	light and careful.	Laurel Hill and Ind. block.	light.	34	30.2
11	M. D. Wells & Co.	2 tubular 100	steam jets, hardly ever used.	light and careful.	Ind. block.	light.	34	30.2
11	Tabernacle Building.	4 tubular 200	McGillicuddy.	careful.	Pittsburgh lump.	light.	34	30.2
11	Kahn, Schoenbrunn & Co.	2 tubular 100	McGinnis.	careful.	Ind. block.	light.	34	30.2
11	Market & Jackson, McCormick Building.	2 tubular 150	McGinnis.	careful.	Ind. block.	light.	34	30.2
11	Kuh, Nathan & Fischer.	3 tubular 150	Thayer.	careful.	Ind. block.	light.	34	30.2

11	Commercial Building.	² tubular 100	bowe.	Ind. block.	medium to black.	34	30.2	
"	S. S. American Exp. Bldg.	⁴ tubular 200	steam jets.	crowded and indiff.	Ill. coal.	34	30.2	
"	Ayer Building.	² tubular 100	Ritchie.	Indiff.	Ind. block.	34	30.2	
"	Mackin Building.	² tubular 100	Hutchinson.	careful.	Ind. block.	34	30.2	
"	C. J. Fry Building.	² tubular 80	none.	crowded.	Ind. block.	34	30.2	
"	Pitkin & Brooks.	² tubular 80	steam jets.	light and careful.	Pittsburgh.	light.	34	30.2
"	Doggett Building.	² tubular 100	arches.	light.	Ill. coal.	light.	34	30.2
"	S. G. Wilkins.	¹ tubular 40	arches.	light.	Ill. coal.	light.	34	30.2
12	J. A. Tolman & Co.	² tubular 120	McGinnis.	careful.	Wilm'gton	light.	42	29.8
"	A. R. Bremer & Co.	² tubular 100	arches.	indiff.	Ill. coal.	medium.	42	29.8
"	Sprague, Warner & Co.	² tubular 100	steam jets.	indiff.	Kentucky lump.	very black.	42	29.8
"	C. H. Slack.	² tubular 100	none.	indiff.	Ind. block.	very black.	42	29.8
"	Mentor Block.	¹ tubular 30	steam jets.	careful.	Ind. block.	black.	42	29.8
"	Studebaker Building	⁴ Babcock & Wilcox 400	Murphy furnace.	automatic.	Illinoian screenings.	very light.	42	29.8
"	Jones School.	² tubular 100	steam jets.	light.	Ill. coal.	black.	42	29.8
"	Regan Printing House	² tubular 100	steam jets.	indiff.	soft coal.	black.	42	29.8

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	REMARKS.
12	Brown, Pettibone & Co.	1 tubular (30) 2 tubular (120)	Olson. Bowe. Smith.	light and careful. careful. indiff.	soft coal screenings. Kentucky lump. Oakhill.	very light. light. black.	29.8 29.8 29.8
"	Rawson Building.	2 tubular (120)					
"	W. F. McLaughlin & Co.	2 tubular (120)					
"	N. S. Weber Boot & Shoe Factory.	1 tubular (30) 2 tubular (120)	none. Hutchinson.	careful. light and careful.	III. coal. Ind. block.	very black. light.	29.8 29.8
"	Price Bk'g. Powder Co.	1 tubular (50)					
"	H. H. Shufeldt & Co. Warehouse.	1 tubular (50) 2 tubular (100) 3 tubular (200)					
"	Lill & Bullen's Malt House.						
13	Western Toy Co.						
"	Cable Eng. House, Elm St.	8 tubular (80)	Rooney furnace.	automatic.	soft coal & screenings.	very light.	40
"	Aug. Beck Tobacco Factory.	2 tubular (100)	steam jets.	light and careful.	Hocking Valley.	light.	30
"	Chicago Marble Co.	2 tubular (120)	none.	indiff.	cheap and poor ill. coal.	very black.	30
"	Samuel Bliss.	1 locomotive (60) 1 tubular (50)	Smith.	careful.	Ind. block.	light.	30
"	Spaulding & Merrick.	2 tubular (120)	Hutchinson.	refuse and soft coal screenings.	refuse and soft coal screenings.	light.	30

13	S. S.	Ft. Dearborn Block.	1 tubular 30	none.	indiff.	Pittsburgh.	medium.	38	30
"		Thompson & Taylor.	2 tubular 100	McGinnis.	careful.	Pittsburgh.	light.	38	30
"		W. M. Hoyt.	1 tubular 30	Kelley.	careful.	Wilm'gton	light.	38	30
"		Central Elevator.	3 tubular 300	McGinnis.	careful.	Ill. coal.	light.	38	30
"		Ely Block.	1 tubular 60	none.	indiff.	Ill. coal.	medium.	38	30
"		John C. Neemes & Co.	1 tubular 60	Hutchinson.	careful.	soft and hard coal screenings.	light.	38	30
"		Royal Hotel.	1 tubular 50	none.	indiff.	Ill. coal.	very black	38	30
14	N. S.	Franklin School.	1 tubular 75	none.	indiff.	Ind. block.	very black	30	29.8
"	"	Bruschke Furniture Co.	2 tubular 120	Hutchinson.	indiff.	shavings & soft coal.	black.	30	29.5
"		107 & 109 Elm Street.	1 tubular 30	none.	careful.	nut coal.	light.	30	29.5
"		Oak Street School.	1 tubular 75	none.	careful.	Ind. block.	light.	30	29.5
"		Chicago Brewing Co.	2 tubular 150	none.	careful.	Ind. block.	light.	30	29.5
"		100 & 108 Wood Street, Aug. 11st.	1 tubular 100	none.	indiff.	shavings & nut coal.	light.	30	29.5
"		Zangmeir Mfg. Co.	2 tubular 100	none.	careless.	shavings & nut coal.	very black.	30	29.5
"	S. S.	Sibley Block.	2 tubular 100	steam jets.	careful.	Ind. block.	light.	30	29.5
"		Kelley, Maus & Co.	2 tubular 120	McGinnis.	careful.	Ind. block.	light.	30	29.5

SMOKE OBSERVATIONS, 1889.—*Continued.*

DATE.	NAME.	BOILERS. HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	TEMPER- ATURE. METERS.	REMARKS.
14	C. & N. W. Office Bldg.	3 tubular 150	arches and Ashcroft doors.	careful.	Ind. block.	light.	50	29.5 March 20. Very black.
"	A. L. Singer & Co.	2 tubular 150	Butman.	careful.	Ind. block.	light.	50	29.5
"	Kohn Bros.	2 tubular 150	Cregier.	light and careful.	Pittsburgh.	light.	50	29.5
"	Willoughby Building	2 tubular 100	none.	light and careful.	Ind. block.	light.	50	29.5 March 20. Very black.
"	J. W. Ostrander.	2 tubular 100	steam jets.	light and careful.	Ind. block.	medium.	50	29.5
15	W. S. Chicago Sugar Works.	32 Babcock & Wilcox 5000	Murphy furnace on part.	automatic.	Ill. coal screenings.	black.	52	29.3 The black smoke was caused by the use of a few boilers that had not yet been fitted with the Murphy furnaces.
"	Crane Bros. Mfg. Co.	2 tubular 100	none.	indiff.	soft coal screenings.	black.	52	29.3
"	City Elevator.	1 tubular 120	none.	careful.	Ind. block.	light.	52	29.3
"	S. S. Union Bag & Paper Co.	2 tubular 120	McLaughlin.	careful.	Ind. block.	light.	52	29.3 Spoke very highly of consumer.
"	Donohue & Hennicherry.	2 tubular 100	Latham.	careful.	soft coal screenings.	light.	52	29.3
"	A. N. Kellogg.	2 tubular 100	Olson.	careful.	Ind. block.	light.	52	29.3
"	Twenty-second Street, Cable Eng. House.	2 Hazelton 4 Babcock & Wilcox	Rooney, Orvis.	automatic.	Ind. slack.	very light.	52	29.3
"	Benis & McAvoys Brewing Co.	4 Babcock & Wilcox 400	none.	careful.	Ind. slack.	black.	52	29.3
				soft and hard coal	soft and hard coal	light and at times black.	52	29.3
				indiff.	screenings.			

15	Cook Brewing Co.	tubular 5 120	none.	careless, device of their own.	medium & soft coal, mt.	52	20.3
"	Scipp Brewing Co.	tubular 400	none.	indif.	Pittsburgh, lump.	52	20.3
"	Keeley Brewing Co.	tubular 4 300	none.	indif.	Ind. block. black.	58	20.3
"	H. Diston & Sons,	tubular 150	none.	crowded.	Pittsburgh, medium to black.	58	20.3
16	Old House,	tubular 6 400	McGinnis.	light.	Pittsburgh, very light.	38	20.3
"	Marshall Field & Co.	tubular 3 150	Hutchinson.	indif.	Ind. block. medium.	38	20.3
"	M. L. Page & Co.	tubular 2 80	"	indif.	Pittsburgh, black.	58	20.3
"	Partridge's.	tubular 80	none.	careful, but crowded.	soft coal & coke.	58	20.3
"	McVicker's Theatre.	tubular 200	Heine Safety perforated bridge wall	automatic.	soft coal screenings.	38	20.3
"	Palmer House.	tubular 500	Murphy furnace.	light and careful.	Ind. block. light.	38	20.3
"	Wauwaaker & Brown	tubular 80	Smith.	careful.	Ind. block. light.	58	20.3
"	Meth. Book Concern.	tubular 75	steam jets.	indif.	Ind. block. medium to black.	58	20.3
"	John Kranz.	tubular 30	steam jets.	careful.	Ind. block. light.	34	20.5
"	Grommes & Ullrich.	tubular 80	steam jets.	light and careful.	Ind. block. light.	34	20.5
18	Gray, Kingman & Collins.	tubular 150	Smith.	light and careful.	Ind. block. light.	34	20.5
"	R. B. Millar & Co.	tubular 120	Whalen.	light and careful.	Ind. coal. light.	34	20.5
"	S. S. 19 & 21 Lake Street,	tubular 150	Hutchinson.	careful.	Jackson Hill.	34	20.5

SMOKI OBSERVATIONS, 1889. — *Continued.*

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	CONDITION OF SMOKE.	COAL USED.	MEASUREMENTS.	REMARKS.
18	Chicago Stamping Co.	2 tubular 100	Cregier.	light and careful.	Ind. block.	medium.	34	29.5 Consumer not in use.
"	A. F. Seelberger & Co.	1 tubular 50	none.	careful.	Ind. block.	light.	34	29.5
"	M. Shields.	1 tubular 75	Kelley.	crowded.	Ind. block.	medium to black.	34	19.5
"	Cameron	2 tubular 120	McLaughlin.	careful.	Ind. block.	light.	34	29.5
"	Amberg & Co.	1 tubular (75)	Smith.	light.	Ind. block.	light.	34	29.5
"	Wells & Nellegar Co.	2 tubular 100	Smith.	crowded.	Ind. block.	light to medium.	34	29.5
"	Marine Building,	brick arches.						March 20. Ver black.
"	F. C. Wilson & Co.	tubular 120						
"	A. H. Andrews.	tubular 90	Olson.	light.	III. coal.	light.	34	29.5
"	Retail House, Carson, Pirie & Co.	4 tubular 200	steam jets.	careful.	Ind. block.	light.	34	29.5
"	C. M. Hotchkiss & Co.	1 tubular .30	steam jets.	indiff.	Pittsburgh slack.	medium.	34	29.5
"	P. Lorillard & Co.	1 tubular 50	Hutchinson.	indiff.	Ind. block.	medium.	34	29.5
"	Skeen & Stuart.	2 tubular 120	steam jets.	indiff.	Laurel Hill	medium.	34	29.5
19	Union Storage Co.	2 tubular 150	none.	indiff.	Pittsburgh	black.	34	29.5

19	Douglas & Stuart.	tubular 225	none.	indiff.	Oat hulls & nut coal.	light.	34	29.5
"	Carsley & E. I. Mfg. Co.	tubular 130	steam jets.	indiff.	nut coal & shavings.	medium.	34	29.5
"	Gootfried Brewing Co.	tubular 200	Smith.	crowded.	Ind. block.	black.	34	29.5
"	L. Hutt Box Factory.	tubular 100	Butman.	crowded.	shavings.	black.	34	29.5
"	S. S. Alton Elevator.	tubular 80	none.	careful.	Ill. coal.	light.	34	29.5
"	N. K. Fairbank & Co.	tubular 1300	Bowe.	careful.	Ill. coal.	light.	34	29.5
"	W. S. L. Huck Co.	tubular 400	none.	indiff.	Ind. block.	medium.	34	29.5
"	Schoenhofen Brg. Co.	tubular 400	none.	indiff.	Ind. block.	black.	34	29.5
"	F. Wenter.	tubular 60	none.	indiff.	shavings & nut coal.	black.	34	29.5
"	R. G. Stevens.	tubular 15	none.	indiff.	Ill. coal.	black.	34	29.5
"	W. E. Frost Mfg. Co.	tubular 150	none.	crowded.	shavings.	medium.	34	29.5
20	This day was spent in taking observations on the ground gone over, and it was demonstrated that even the heretofore best behaved chinneys were making a great amount of smoke, due to carelessness in firing in most cases. About forty observations were made, with the result as marked in the "remarks" column in every case observed. There was, this day, a sudden change in the weather, from mild to cold.							
21	S. S. Schlosser Block.	tubular 80	none.	careful.	Ind. block.	medium.	40	30.2
"	C. B. & Q. Gen. Office.	3 tubular 1 Babcock & Wilcox 100	McGinnis.	careful.	Ind. block.	very light.	40	30.2
"	Comsemanian Building.	tubular 100	Hutchinson.	careful.	Ind. block.	medium.	40	30.2

SMOKE OBSERVATIONS, 1889.—*Continued.*

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THE MEASURED AMOUNT.	REMARKS.
21	N. S. N. Side Water Works.	12 boilers, ² with Murphy furnace	1 Murphy furnace.	careful.	hard coal, soft coal.	very light.	40	30.2
"	Strom Mfg. Co.	tubular (75)	none.	indiff.	III. coal.	very black.	40	30.2
"	J. L. Dietz & Co.	tubular (12)	Hutchinson.	crowded.	shavings & nut coal.	black.	40	30.2
"	" Linde Ice Mach. Co.	tubular (2)	none.	light and careful.	nut coal.	light to medium.	40	30.2
"	Armour Elevator.	tubular (40)	Butman.	careful.	Ind. block.	very light.	40	30.2
"	Biggler & Tindiesen.	tubular (40)	none.	careless.	III. coal.	very black.	40	30.2
"	Pacific Elevator.	tubular (12)	none.	careful.	Pittsburgh.	medium.	40	30.2
"	Bemis & Curtis.	tubular (30)	none.	indiff.	III. coal.	black.	40	30.2
22	W. S. Baragwanath & Son.	tubular (50)	none.	indiff.	slack.	black.	42	30.5
"	Ideal Folding Bed Co.	tubular (50)	none.	careless.	nut coal.	black.	42	30.5
"	Chicago Malt & Grain Co.	tubular (75)	none.	careful.	Pittsburgh.	medium.	42	30.5
"	Union	tubular (12)	none.	indiff.	nut coal.	black	42	30.5
"	Hide & Leather Co.	tubular (3)	none.	shavings & nut coal.	crowded.	very black.	42	30.5
"	H. Paepcke & Co.	tubular (30)	none.					

22	Kiltz & Mangson.	2 tubular 10	none.	careless, nut coal.	shavings & very black	42	30.5	
22	N. Eisenhardt.	1 tubular 10	none.	indiff.	nut coal.	42	30.5	
22	Koenig & Gamer.	2 tubular 100	none.	careful.	shavings & light.	42	30.5	
44	Briston & Co.	1 tubular 10	none.	careful.	shavings & light.	42	30.5	
44	N. S. Ernst Bros. Brg. Co.	3 tubular 25	none.	careful.	Pittsburgh, medium.	42	30.5	
44	Wolf Bros. & Nolan.	1 tubular 15	none.	indiff.	shavings & slack,	42	30.5	
44	Fullerton Av. Station.	3 tubular 35	Tinkham.	ordinary.	Pittsburgh, medium.	42	30.5	
44	N. W. Parlor Suit Co.	2 tubular 150	Butman.	indiff.	refuse and nut coal.	42	30.5	
44	" Corper & Nockin.	2 tubular 150	none.	indiff.	nut coal.	42	30.5	
44	Phenix Distillery.	10 tubular 120	Murphy furnace.	automatic.	slack,	very light.	42	30.5
44	Geo. A. Weiss Malt H.	2 tubular 120	none.	indiff.	Ind. block.	black.	42	30.5
44	F. H. Stephens.	1 tubular 50	none.	careless.	Ind. block.	very black.	42	30.5
23	W. S. County Hospital.	8 tubular 600	Hutchinson.	indiff.	Ind. block.	black.	42	30
44	Rush Medical College.	3 tubular 120	none.	ordinary.	Ind. block.	medium.	42	30
44	Chicago Hospital for Women.	2 tubular 150	none.	indiff.	Ind. block.	black.	42	30
44	Frankle & Sievers.	1 tubular 50	none.	careless.	shavings & nut coal.	black.	42	30

SMOKE OBSERVATIONS, 1889.—Continued.

DATE.	NAME.	BOILERS, HORSE POWER.	DEVICE IN USE.	MODE OF FIRING.	COAL USED.	CONDITION OF SMOKE.	THEM- O-METER. METRE.	HARO- METER. METRE.	REMARKS.
23	Wisconsin Elevator.	2 tubular 150	none.	careless.	Pittsburgh.	black.	42	30	
"	Hoerber Brewing Co.	2 tubular 150	none.	indiff.	Pittsburgh.	black.	42	30	
"	W. Side Water Works.	12 tubular 250	brick arches.	crowded.	Pittsburgh.	black.	52	30	
"	J. S. Gougar & Co.	2 tubular 150	none.	careless.	shavings & nut coal.	black.	42	30	
"	Hair & Ridgeway.	2 tubular 250	Butman.	careful.	shavings & nut coal.	medium.	42	30	
"	Stephens Bros. & Co.	3 tubular 150	none.	crowded.	shavings.	black.	42	30	
"	T. Wilce & Co.	3 tubular 120	none.	crowded.	shavings.	black.	42	30	
"	T. Goodwillie & Co.	2 tubular 150	none.	crowded.	shavings.	very black.	42	30	
"	T. C. Diener.	1 tubular 75	none.	careful.	nut coal.	medium.	42	30	
"	T. W. Harvey & Co.	2 tubular 150	none.	crowded.	shavings.	black.	42	30	
26	Crane Bros. Mfg. Co.	4 tubular 300	air blast.	ordinary.	hard coal screenings.	light.	48	20.5	
"	F. Krause & Co.	1 tubular 50	none.	careless.	nut coal.	very black.	48	20.5	
"	Chicago Screw Co.	2 tubular 120	Butman.	careful.	nut coal.	light.	48	28.5	

26	Beidler Building.	4 tubular 30	Kelley.	careful.	Ind. block.	light.	48	29.5
"	Frances Building.	2 tubular 130	Farr.	indiff.	nut coal.	very light.	48	29.5
"	S. K. Martin.	2 tubular 130	none.	crowded.	shavings.	black.	48	29.5
"	S. B. Barker & Co.	3 tubular 275	none.	careless.	shavings.	very black.	48	29.5
"	Garyn & Jenkinson.	2 tubular 130	none.	indiff.	nut coal.	black.	48	29.5
"	Rabbitt, Harry & Toley	2 tubular 100	none.	careless.	shavings & nut coal.	very black.	48	29.5
"	Perren & Menzie.	2 tubular 100	steam jets.	careful.	Ind. block.	light.	48	29.5

TOTAL NUMBER OF PLACES VISITED, 333; INCLUDING 839 BOILERS.

Since this report was put in type, the examiner has inspected the Danford and Sagle Smoke Consumer at the North-Western Car Shops; its operation is faultless in its application to the locomotive type of stationary boiler.



